

1 What is claimed is:

2
3 1. An electro-mechanical wireline assembly for anchoring a
4 wireline tool string in place in a well bore during underbalanced
5 well conditions, the assembly comprising:

6
7 upper connecting means for connecting the assembly to a wireline
8 leading to the well surface;

9
10 lower connecting means for engaging a wireline tool;

11
12 an outer mandrel connected to the lower connecting means;

13
14 an inner mandrel carried at least partly within the outer mandrel
15 and capable of axial movement relative thereto;

16
17 a slip gripping assembly carried on the outer mandrel and including
18 a plurality of gripping slips normally biased radially inward but
19 movable radially outward for engaging a surrounding well bore and
20 holding the wireline tool string in place in the well bore;

21
22 an electric motor assembly carried on the wireline assembly between
23 the upper connecting means and the lower connecting means, the
24 electric motor assembly being actuable by an electric current
25 supplied from the well surface through the wireline to effect axial
26 movement of the inner mandrel relative to the outer mandrel to
27 expand the gripping slips in a radial direction between a start
28 position and a set position;

1 switch means included as a part of the electric motor assembly for
2 reversing the direction of axial movement of the inner mandrel
3 relative to the outer mandrel to retract the gripping slips and
4 return the slips to the start position; and

5
6 wherein the assembly further comprises back-up manual release means
7 for manually retracting the gripping slips radially inward upon
8 completion of wellbore operations.

9
10 2. The electro-mechanical wireline assembly of claim 1, wherein the
11 lower connecting means is connected to a wireline tool selected
12 from the group consisting of a well perforating gun assembly and a
13 well production logging assembly.

14
15 3. The electro-mechanical wireline assembly of claim 2, wherein the
16 slip gripping assembly includes at least three gripping slips
17 located 120 degrees apart on an exterior surface of the outer
18 mandrel.

19
20 4. The electro-mechanical wireline assembly of claim 3, wherein the
21 electric motor assembly includes an electric motor and a screw
22 driven by the electric motor to effect axial movement of the inner
23 mandrel relative to the outer mandrel.

24
25 5. The electro-mechanical wireline assembly of claim 4, wherein the
26 screw is drivable in either a forward or reverse direction by the
27 application of electric current through the wireline from the well
28 surface to the electric motor.

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6. The electro-mechanical wireline assembly of claim 5, further comprising:

a collet housing including a plurality of downwardly extending collet fingers carried about the outer mandrel at an upper extent thereof, the collet housing being threadedly engaged to an outer motor housing.

7. The electro-mechanical wireline assembly of claim 6, wherein the outer motor housing is threadedly engaged to a coiled wire housing which, in turn, is threadedly engaged to the top adapter.

8. The electro-mechanical wireline assembly of claim 7, wherein the collet housing is initially retained in a running in position by at least one retaining dog carried in an opening provided on the outer mandrel adjacent the upper extent thereof.

9. The electro-mechanical wireline assembly of claim 8, wherein the inner mandrel is provided with a recess for receiving the at least one retaining dog, movement of the retaining dog into the recess serving to allow movement of the collet housing axially downward relative to the outer mandrel whereby the collet fingers can engage a collet latch housing.

10. The electro-mechanical wireline assembly of claim 9, wherein
the collet latch housing is connected to a slip guide which
underlies the gripping slips in the set position, the connection to
the slip guide being severable by upward axial movement of the
collet housing, thereby allowing the slip guide to be moved from
beneath the gripping slips whereby the gripping slips can be
returned to the start position.

11. An electro-mechanical wireline assembly for anchoring a
perforating gun assembly in place in a well bore during
underbalanced well conditions, the assembly comprising:

upper connecting means for connecting the assembly to a wireline
leading to the well surface;

lower connecting means engaged to a perforating gun assembly
including at least one wireline actuated perforating gun;

an outer mandrel connected to the lower connecting means;

an inner mandrel carried at least partly within the outer mandrel
and capable of axial movement relative thereto;

a slip gripping assembly carried on the outer mandrel and including
a plurality of gripping slips normally biased radially inward but
movable radially outward for engaging a surrounding well bore and
holding the wireline tool string in place in the well bore;

SUB 11 an electric motor assembly carried on the wireline assembly between
2 the upper connecting means and the lower connecting means, the
3 electric motor assembly being actuable by an electrical current
4 supplied from the well surface through the wireline to effect axial
5 movement of the inner mandrel relative to the outer mandrel to
6 expand the gripping slips in a radial direction between a start
7 position and a set position;

8
9 switch means provided as a part of the electric motor assembly and
10 actuable to move the inner mandrel in a reverse axial direction in
11 response to an electrical current supplied through the wireline
12 from the well surface to retract the gripping slips and return the
13 slips to the start position.

14
15 12. The electro-mechanical wireline assembly of claim 11, wherein
16 the slip gripping assembly includes at least three gripping slips
17 located 120 degrees apart on an exterior surface of the outer
18 mandrel.

19
20 13. The electro-mechanical wireline assembly of claim 12, wherein
21 the electric motor assembly includes an electric motor and a screw
22 driven by the electric motor and connected to the inner mandrel to
23 effect axial movement of the inner mandrel relative to the outer
24 mandrel.

25
26 14. The electro-mechanical wireline assembly of claim 13, wherein
27 the screw is drivable in either a forward or reverse direction by
28 the application of electric current through the wireline from the
29 well surface to the electric motor.

Sub A 15. The electro-mechanical wireline assembly of claim 14, further
2 comprising:

3
4 a collet housing including a plurality of downwardly extending
5 collet fingers carried about the outer mandrel at an upper extent
6 thereof, the collet housing being threadedly engaged to an outer
7 motor housing.

8
9 16. The electro-mechanical wireline assembly of claim 15, wherein
10 the outer motor housing is threadedly engaged to a coiled wire
11 housing which, in turn, is threadedly engaged to the top adapter.

12
13 17. The electro-mechanical wireline assembly of claim 16, wherein
14 the collet housing is initially retained in a running in position
15 by at least one retaining dog carried in an opening provided on the
16 outer mandrel adjacent the upper extent thereof.

17
18 18. The electro-mechanical wireline assembly of claim 17, wherein
19 the inner mandrel is provided with a recess for receiving the at
20 least one retaining dog, movement of the retaining dog into the
21 recess serving to allow movement of the collet housing axially
22 downward relative to the outer mandrel whereby the collet fingers
23 can engage a collet latch housing.

24
25 19. The electro-mechanical wireline assembly of claim 18, wherein
26 the collet latch housing is
27 connected to a slip guide which underlies the gripping slips in the
28 set position, the connection to the slip guide being severable by
29 upward axial movement of the collet housing and the collet latch

~~Sub~~ housing, thereby allowing the slip guide to be moved from beneath
2 the gripping slips whereby the gripping slips can be returned to
3 the start position.

4
5 20. The electro-mechanical wireline assembly of claim 19, wherein
6 the slip guide includes upper collet fingers which are initially
7 retained in a running in position by an interior surface of the
8 collet latch housing and wherein the collet latch housing has an
9 internal profile for receiving the slip guide collet fingers upon
10 upward axial movement effected by the engagement of the collet
11 housing collet fingers with the collet latch housing.

12
13 21. The electro-mechanical wireline assembly of claim 20, wherein
14 the collet latch housing is initially connected to the slip guide
15 by a plurality of shear screws, the shear screws being severable by
16 upward tension exerted on the collet latch housing by the collet
17 housing.

18
19 22. A method for anchoring a wireline perforating assembly in
20 place in a well bore during underbalanced well conditions, the
21 method comprising the steps of:

22
23 providing an electro-mechanical wireline assembly having upper
24 connecting means for connecting the assembly to a wireline leading
25 to the well surface;

26
27 connecting a wireline perforating assembly to a lower connecting
28 means provided on the ~~electro-mechanical wireline assembly;~~
29

SUB 1/ providing an outer mandrel connected to the lower connecting means;

2
3 providing an inner mandrel carried at least partly within the outer
4 mandrel and capable of axial movement relative thereto;

5
6 providing a slip gripping assembly carried on the outer mandrel and
7 including a plurality of gripping slips normally biased radially
8 inward but movable radially outward for engaging a surrounding well
9 bore and holding the wireline tool string in place in the well
10 bore;

11
12 providing an electric motor assembly carried on the wireline
13 assembly between the upper connecting means and the lower
14 connecting means, the electric motor assembly being actuable by an
15 electric current supplied from the well surface through the
16 wireline to effect axial movement of the inner mandrel relative to
17 the outer mandrel to expand the gripping slips in a radial
18 direction between a start position and a set position;

19
20 providing switch means included as a part of the electric motor
21 assembly for reversing the direction of axial movement of the inner
22 mandrel relative to the outer mandrel to retract the gripping slips
23 and return the slips to the start position;

24
25 running the electro-mechanical wireline assembly into position at
26 a subterranean location within the well bore;

SUBA
1 supplying an electrical current to the electric motor assembly to
2 move the inner radial mandrel axially relative to the outer mandrel
3 and thereby set the gripping slips;

4
5 actuating the perforating gun assembly by an electric current
6 supplied from the well surface;

7
8 reversing the direction of movement of the inner mandrel relative
9 to the outer mandrel by the application of an additional electrical
10 current from the well surface through the wireline, said movement
11 serving to allow the gripping slips to be retracted radially inward
12 to the start position; and

13
14 retrieving the electro-mechanical wireline assembly and perforating
15 gun assembly to the well surface.

16
17 23. The method of claim 22, wherein the electric motor assembly
18 includes an electric motor and a screw driven by the electric motor
19 to effect axial movement of the inner mandrel relative to the outer
20 mandrel.

21
22 24. The method of claim 22, wherein the switch means is actuated to
23 drive the screw in either a forward or reverse direction by the
24 application of electric current through the wireline from the well
25 surface to the electric motor.

26
27 25. The method of claim 24, wherein the electro-mechanical wireline
28 assembly is further provided with back-up manual release means for

1 manually retracting the gripping slips radially inward upon
2 completion of wellbore operations.

SUBA 26. The method of claim 25, wherein the back-up manual release
5 includes a collet housing including a plurality of downwardly
6 extending collet fingers carried about the outer mandrel at an
7 upper extent thereof, the collet housing being threadedly engaged
8 to an outer motor housing, the outer motor housing being threadedly
9 engaged to a coiled wire housing which, in turn, is threadedly
10 engaged to the top adapter.

11
12 27. The method of claim 26, wherein the collet housing is initially
13 retained in a running in position by at least one retaining dog
14 carried in an opening provided on the outer mandrel adjacent the
15 upper extent thereof.

16
17 28. The method of claim 27, wherein the inner mandrel is provided
18 with a recess for receiving the at least one retaining dog,
19 movement of the retaining dog into the recess serving to allow
20 movement of the collet housing axially downward relative to the
21 outer mandrel whereby the collet fingers can engage a collet latch
22 housing.

23
24 29. The method of claim 28, wherein the collet latch housing is
25 connected to a slip guide which underlies the gripping slips in the
26 set position, the connection to the slip guide being severable by
27 upward axial movement of the collet housing, thereby allowing the
28 slip guide to be moved from beneath the gripping slips whereby the
29 gripping slips can be returned to the start position.

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30. The method of claim 29, wherein the slip guide includes upper
2 collet fingers which are initially retained in a running in
3 position by an interior surface of the collet latch housing and
4 wherein the collet latch housing has an internal profile for
5 receiving the slip guide collet fingers upon upward axial movement
6 effected by the engagement of the collet housing collet fingers
7 with the collet latch housing.

31. The method of claim 30, wherein the collet latch housing is
9 initially connected to the slip guide by a plurality of shear
10 screws, the shear screws being severable by upward tension exerted
11 on the collet latch housing by the collet housing.